

CERTIFICATION OF TRANSLATION

I, *Yeon-ju Ryu*, an employee of Y.P.LEE, MOCK & PARTNERS of Koryo Building, 1575-1 Seocho-dong, Seocho-gu, Seoul, Republic of Korea, hereby declare under penalty of perjury that I understand the Korean language and the English language; that I am fully capable of translating from Korean to English and vice versa; and that, to the best of my knowledge and belief, the statement in the English language in the attached translation of Korean Patent Application No. 10-2002-0065674 consisting of 43 pages, have the same meanings as the statements in the Korean language in the original document, a copy of which I have examined.

Signed this 4th day of January 2007

A handwritten signature in black ink, appearing to read "Y.P.LEE, MOCK & PARTNERS", is written over a horizontal line.

A B S T R A C T

[Abstract of the Disclosure]

Provided are an information storage medium on which information on a drive and
5 information on the state of a disc is recorded in a zone of a recordable area and a
method of recording information on the information storage medium. The information
storage medium (a disc) includes an area and a user data area. The area includes a
recordable zone having a drive & disc zone in which information on a drive and
information on a state of the disc is recorded. The drive & disc zone includes a
10 plurality of physical clusters or ECC blocks and the information on the drive and the
information on the state of the disc is recorded in the same physical cluster or ECC
block or different physical clusters or ECC blocks.

[Representative Drawing]

15 FIG. 2

S P E C I F I C A T I O N

[Title of the Invention]

5 INFORMATION STORAGE MEDIUM AND METHOD OF RECORDING
INFORMATION THEREON

[Brief Description of the Drawings]

10 FIG. 1 illustrates the data structure of a lead-in or lead-out area according to the
present invention.

FIG. 2 is a view for explaining an information storage medium and a method of
recording information thereon according to a first embodiment of the present invention.

15 FIG. 3 is a view for explaining an information storage medium and a method of
recording information thereon according to a second embodiment of the present
invention.

FIGS. 4A and 4B are views for explaining an information storage medium and a
method of recording information thereon according to a third embodiment of the present
invention.

20 FIG. 5 illustrates information on a drive and on the state of a disc, the information
being recorded in a drive & disc zone of an information storage medium according to
the present invention.

FIGS. 6A and 6B are views for explaining an information storage medium and a
method of recording information thereon according to a fourth embodiment of the
present invention.

25 FIGS. 7A and 7B are views for explaining an information storage medium and a
method of recording information thereon according to a fifth embodiment of the present
invention.

FIGS. 8A, 8B, and 9 are views for explaining another example of the fifth
embodiment of the present invention.

30 <Explanation of Reference numerals designating the Major Elements of the Drawings >

5: read-only zone	10: recordable zone
10a: defect management area	10b: control data zone

10c: OPC test zone

10d: drive & disc zone

10e: buffer zone

10-0, 10-1,...,10-n: physical cluster or ECC block

10-0-0, 10-0-1, 10-0-2,..., 10-n-0, 10-n-1,..., 10-n-m: recording unit

5

[Detailed Description of the Invention]

[Object of the Invention]

[Technical Field of the Invention and Related Art prior to the Invention]

The present invention relates to an information storage medium on which

10 information on a drive and information on the state of a disc is recorded in a zone of a recordable area and a method of recording information thereon.

When a 4.7GB digital versatile disc-random access memory (DVD-RAM) is loaded into a drive, information on the drive, e.g., information on the drive maker, a serial number, and so forth, is recorded in a rewritable identification zone of a lead-in area of the disc. A 20GB high-density (HD)-DVD also has a lead-in area including a drive zone with a plurality of physical clusters so as to record information on a used drive in the drive zone.

20 In particular, since information is recorded only once in an optimum power control (OPC) zone necessary for testing a disc or a drive information zone of a once-writable information storage medium, the once-writable information storage medium requires updated information on its state as well as information on a used drive so that the drive can rapidly access the once-writable information storage medium when recording additional user data in unrecorded zones after recording user data.

25 Accordingly, a method of efficiently recording new information regarding a new drive and state of the disc should be proposed to satisfy a new format of an information storage medium.

[Technical Goal of the Invention]

30 The present invention provides an information storage medium on which information on a drive and information on the state of the medium can be recorded in a zone composed of a plurality of error correcting code (ECC) blocks or physical clusters, so that the drive can rapidly access the medium using the recorded information and

user data can be efficiently recorded and/or reproduced, and a method of recording information thereon.

[Structure and Operation of the Invention]

5 According to an aspect of the present invention, there is provided an information storage medium (a disc) including an area and a user data area. The area includes a recordable zone having a drive & disc zone in which information on a drive and information on a state of the disc is recorded. The drive & disc zone includes a plurality of physical clusters or ECC blocks and the information on the drive and the 10 information on the state of the disc is recorded in a physical cluster or ECC block.

Whenever the information on the drive and the information on the state of the disc is updated, the updated information is recorded in a physical cluster or ECC block different from a physical cluster or ECC block in which information on a previous drive and information on a previous state of the disc is recorded, particularly in a physical 15 cluster or ECC block following a physical cluster or ECC block in which information on a last drive and information on a last state of the disc is recorded.

Each of the plurality of physical clusters or ECC blocks comprises a plurality of recording units, and the information on the drive and the information on the state of the disc may be sequentially recorded in different recording units or the same recording unit 20 of a physical cluster or an ECC block.

It is preferable that information on a new drive and information on a latest state of the disc is recorded in a starting recording unit of the physical cluster or ECC block, and then the information on the drive and the information on the state of the disc is copied into a recording unit right after the starting recording unit.

25 According to another aspect of the present invention, there is also provided an information storage medium (a disc) including an area and a user data area. The area includes a recordable zone having a drive & disc zone in which information on a drive and information on a state of the disc is recorded. The drive & disc zone includes a plurality of physical clusters or ECC blocks and the information on the drive and the 30 information on the state of the disc is recorded in different physical clusters or ECC blocks.

The information on the drive and the information on the state of the disc are sequentially and alternately recorded starting from a beginning part of the drive & disc

zone. Alternatively, the drive & disc zone may be divided into two zones, and one of the information on the drive and the information on the state of the disc may be recorded in a first zone of two zones and the remaining information may be recorded in a second zone of two zones.

5 The information on the state of the disc may include at least one of an address of a zone in which new OPC data is recorded, an address of a zone in which information on a last drive and information on a latest state of the disc is recorded, a last recorded address of a zone in which user data is lastly recorded, information on the number of sessions, write protection information, information for indicating whether additional user
10 data is recordable after recording user data, and information necessary for indicating an address of a zone in which information on a subsequent drive and information on a subsequent state of the disc is to be recorded or information necessary for indicating an address of a zone in which user data is to be recorded.

According to still another aspect of the present invention, there is also provided a
15 method of recording information on an information storage medium (a disc).

Information on a drive and information on a state of the disc is recorded in one of a plurality of physical clusters or ECC blocks of a drive & disc zone of a recordable zone included in an area except a user data area. Information on a new drive and information on a latest state of the disc is recorded in a physical cluster or an ECC block
20 different from a physical cluster or an ECC block in which the information on the drive and the information on the state of the disc is recorded whenever the information on the drive and the information on the state of the disc is updated.

According to yet another aspect of the present invention, there is also provided a method of recording information on an information storage medium (a disc).

25 Information on a drive and information on a state of the disc is recorded in different physical clusters or ECC blocks of a plurality of physical clusters or ECC blocks of a drive & disc zone of a recordable zone included in an area except a user data area. Information on a new drive and information on a latest state of the disc is recorded in a physical cluster or ECC block different from a physical cluster or ECC block in which the
30 information on the drive and the information on the state of the disc is recorded whenever the information on the drive and the information on the state of the disc is updated.

According to yet another aspect of the present invention, there is also provided a method of recording information on an information storage medium (a disc).

Information on a state of the disc and information on a drive is recorded in one of a plurality of physical clusters or ECC blocks of a drive & disc zone of a recordable zone

5 included an area except a user data area. Updated information on the state of the disc and updated information on the drive is recorded in a physical cluster or an ECC block following the physical cluster or the ECC block in which the information on the state of the disc and the information on the drive is recorded. The information on the drive is copied after recording the updated information on the drive.

10 The updated information on the state of the disc is recorded in a 0th recording unit of a predetermined physical cluster or ECC block, the updated information on the drive is recorded in a first recording unit right after the 0th recording unit, and the information on the previous drives is sequentially copied into recording units after the first recording unit.

15 The updated information on the drive is recorded in a 0th recording unit of a predetermined physical cluster or an ECC block, the information on previous drives is sequentially copied into recording units after the 0th recording unit, and the updated information on the state of the disc is recorded in a recording unit right after a last one of the recording units into which the information on the previous drives is copied.

20 The updated information on the drive is recorded in a 0th recording unit of a predetermined physical cluster or an ECC block, the information on previous drives is sequentially copied into recording units after the 0th recording unit, and the updated information on the state of the disc is recorded in a recording unit right after a last one of the recording units into which the information on the previous drives is copied.

25 Hereinafter, an information storage medium (a disc) and a method of recording information thereon according to the present invention will be described in detail with reference to the attached drawings.

FIG. 1 illustrates the physical structure of a lead-in area having a predetermined diameter starting from the central hole of an information storage medium (a disc) according to the present invention. The lead-in area includes a read-only zone 5 in which data is pre-recorded and a recordable zone 10. Disc-related control data is pre-recorded as pits or high frequency wobbles in the read-only zone 5 when manufacturing the disc and is only readable.

The recordable zone 10 includes a defect management area 10a in which information necessary for handling and managing defects on the disc is recorded, a control data zone 10b, an OPC test zone 10c in which information necessary for optimally controlling a power is recorded, and a buffer zone 10e.

5 Here, the recordable zone 10 further includes a drive & disc zone 10d in which information on a drive and information on the state of the disc is recorded. The drive & disc zone 10d is composed of a plurality of physical clusters or ECC blocks, each of which may be composed of a plurality of recording units such as sectors or data frames. The information on the drive includes information on a manufacturer, manufacturing
10 company-related information, a manufacture number, a serial number of the drive, and so forth. The information on the state of the disc includes at least one of an address of a zone in which new OPC data is recorded, an address of a zone in which information on a last drive is recorded, a last recorded address of a zone of a user data area in which user data is lastly recorded, information on the number of sessions, write
15 protection information, and information for indicating whether additional user data is recordable in a user data area after recording write user data.

According to the present invention, information on the drive and the information on the state of the disc is recorded in the drive & disc zone 10d of the disc having the plurality of physical clusters or ECC blocks. In this case, each time information on a
20 new drive is recorded and the information on the state of the disc is updated, the information is recorded in a physical cluster or ECC block different from one of the plurality of physical clusters or ECC blocks in which the information on the previous drive and the information on the previous state of the disc is recorded. In particular, it is preferable that whenever information on a new drive is recorded and the information
25 on the state of the disc is updated, the information on the new drive and the updated information on the state of the disc is recorded in a physical cluster or ECC block following the physical cluster or ECC block in which the information on the previous drive and the information on the previous state of the disc is recorded. The drive & disc zone 10d may be included in each of the areas except the user data area. For
30 example, the drive & disc zone 10d may be included in at least one of the lead-in area and a lead-out area (not shown). The lead-out area may have a similar structure to the lead-in area.

Referring to FIG. 2, the drive & disc zone 10d of an information storage medium (a disc) according to a first embodiment of the present invention may include n+1 physical clusters or ECC blocks ranging from a 0th physical cluster or ECC block 10-0 to a nth physical cluster or ECC block 10-n. Each of the (n+1) physical clusters or ECC blocks 5 may be composed of a plurality of recording units such as sectors or data frames. Hereinafter, only physical clusters will be described for convenience. For example, the 0th physical cluster 10-0 may be composed of m+1 recording units ranging from a 0th recording unit 10-0-0 to an mth recording unit 10-0-m.

According to the first embodiment, information on a drive and information on the 10 state of the disc is recorded in a physical cluster. For example, information on a 0th drive is recorded in a 0th recording unit 10-0-0 of a 0th physical cluster 10-0 and information on a 0th state of the disc is recorded in a first recording unit 10-0-1 of the 0th physical cluster 10-0. Dummy data is recorded in remaining recording units of the 0th physical cluster. Thereafter, when a new drive records data on and/or reproduce data 15 from the disc, information on the new drive, i.e., information on a first drive, is recorded in a 0th recording unit 10-1-0 of a first physical cluster 10-1 after the 0th physical cluster 10-0. Here, the information on the state of the disc is updated, i.e., information on a first state of the disc is recorded in a first recording unit 10-1-1 of the first physical 20 cluster 10-1. Next, the information on the 0th drive and the information on the 0th state of the disc is copied from the 0th and first recording units of the 0th physical cluster into a second recording unit 10-1-2 and a third recording unit 10-1-3 of the first physical cluster 10-1, respectively.

When a new drive, i.e., a second drive, records data on the disc, information on the second drive and information on a second state of the disc is recorded in a second 25 physical cluster 10-2 following a physical cluster in which data is lastly recorded, i.e., the first physical cluster 10-1. Here, the information on the second drive is recorded in a 0th recording unit 10-2-0 of the second physical cluster 10-2 and the information on the second state of the disc is recorded in a first recording unit 10-2-1 of the second physical cluster 10-2. Next, the information on the first drive, the information on the 30 first state of the disc, the information on the 0th drive, and the information on the 0th state of the disc is copied into second, third, fourth, and fifth recording units 10-2-2, 10-2-3, 10-2-4, and 10-2-5 of the second physical cluster 10-2, respectively, following the 0th and first recording units 10-2-0 and 10-2-1.

As described above, every time information on a new drive and information on a new state of a disc is recorded in a physical cluster following a physical cluster in which information on a previous drive and information on a previous state of the disc is recorded, the information on the previous drive and the information on the previous state of the disc is also recorded in the physical cluster in which the information on the new drive and the information on the new state of the disc is recorded. This is to inform a new drive of information on a previous drive and the history of the state of the disc. Information on the new drive and information on a new state of the disc is recorded in starting sections of a physical cluster and the information on the previous drive and the information on the previous state of the disc is copied into sections of the physical cluster following the starting sections. Therefore, a user can obtain information on all used drives and information on all states of the disc by reproducing the physical cluster in which the information on the new drive and the information on the new state of the disc is recorded, without reproducing the physical cluster in which the information on the previous drive and the information on the previous states of the disc is recorded. As a result, the user can efficiently manage a new drive or efficiently check the state of a disc.

As previously described, the information on the state of the disc includes an address of a zone in which new OPC data is recorded, an address of a zone in which information on a last drive is recorded, a last recorded address of a zone of a user data area in which user data is lastly recorded, write protection information, and information for indicating whether additional user data is recordable in a user data area after recording user data. This will be explained in detail below.

Information on a recording and/or reproduction power necessary for recording and/or reproducing user data is recorded in the OPC test zone 10c whenever user data is recorded, and the recording and/reproduction power can be adjusted to an optimum state using this information. New data corresponding to a power used whenever recording is performed is recorded as the information on the recording and/or reproduction power. In particular, in an event that a once-writable optical information storage medium is used, OPC data is recorded in a new zone in which data was not previously recorded whenever new data is recorded. When new data is recorded after recording of data is completed, a zone in which new OPC data is to be recorded has to be found. Due to this, it is preferable that an address of the zone in which new OPC

data is recorded is written to a predetermined zone so that a used drive can rapidly access it. In other words, the drive can quickly access a zone in which new OPC data is to be recorded when recording new OPC data by recording an address of a zone in which OPC data is lastly recorded in the drive & disc zone 10d and reproducing the 5 address of the zone in which OPC data is lastly recorded without reproducing all zones in which OPC data is recorded.

As the information on the drive, information on the drive and information on the state of the disc is updated whenever a new drive records information on the disc. Thus, it is preferable that an address of a zone in which information on a lastly used 10 drive and information on a last state of the disc is recorded as the information on the state of the disc. Thereafter, a position in which information on a new drive or information on a new state of the disc is to be recorded can be easily found when recording information on the new drive by reproducing the address of the zone in which information on the lastly used drive and the last state of the disc is recorded.

15 When recording of user data stops, and then new user data is recorded, a pickup has to find out and access a zone in which user data is to be recorded. Thus, it is preferable that an address of a zone in which user data is lastly recorded is recorded in the drive & disc zone 10d so that the pickup has a rapid access to the zone in which user data is to be recorded.

20 Instead of the address of the zone in which the information on the last drive and the information on the last state of the disc is recorded or the address of the zone in which user data is lastly recorded, an address of a zone in which information on a subsequent drive and information on a subsequent state of the disc will be recorded or an address of a zone in which subsequent user data will be recorded may be recorded 25 in the drive & disc zone 10d.

If the information on the state of the disc containing information on a latest state of the disc is not supplied, all information recorded in the OPC test zone 10b, the drive & disc zone 10d, or the user data area has to be reproduced when recording user data. Thus, it takes a large amount of time for the drive to access the disc.

30 Information on the number of sessions necessary for determining how many sections the user data area is divided into may be recorded as the information on the state of the disc. For example, the information on the number of sessions can be

supplied in order to divide the user data area into several sections according to their use purpose or capacity so that the disc can be further conveniently used.

After recording of user data is completed, it is preferable that information necessary for determining whether additional user data is recordable is recorded immediately after the zone in which user data is lastly recorded. Data indicating that recording of additional user data is impossible after recording of user data is completed can be recorded so that additional user data is not recorded any more. However, if recording of additional user data is possible, data indicating that additional user data can be recorded right after the zone in which user data is lastly recorded is recorded.

10 The information on the state of the disc can be recorded in the drive & disc zone 10d of the recordable zone 10 of the lead-in or lead-out area whenever recording of user data is finished. As a result, the pickup can accurately and rapidly access a corresponding zone using the information on the state of the disc when recording user data later. Also, user data can be efficiently recorded and/or reproduced. In 15 particular, the information on the state of the disc is useful for a once-writable information storage medium.

As described above, according to the first embodiment, information on a drive and information on the state of a disc can be recorded together. Also, whenever this information is updated, the updated information can be recorded in a physical cluster or 20 ECC block following a physical cluster or ECC block in which information on a previous drive and information on a previous state of the disc is recorded.

An information storage medium (a disc) and a method of recording information thereon according to a second embodiment of the present invention will be described.

Referring to FIG. 3, the drive & disc zone 10-d is composed of a plurality of 25 physical clusters or ECC blocks 10-1, 10-2, ..., and 10-n, each of which is composed of a plurality of recording units 10-0-0, 10-0-1, ..., and 10-0-m such as sectors or data frames. According to the second embodiment, information on a 0th drive and information on a 0th state of the disc is recorded in different physical clusters or ECC blocks. Thereafter, when a new drive records data on and/or reproduces data from the 30 disc, information on the new drive and updated information on the state of the disc is also recorded in different physical clusters or ECC blocks. Preferably, the information on the new drive and the updated information on the state of the disc is recorded in physical cluster or ECC blocks following physical clusters or ECC blocks in which

information on a previous drive and information on a previous state of the disc is recorded. Here, information on all used drives and information on all states of the disc is alternately recorded from a starting part of the drive & disc zone 10d. Hereinafter, only physical clusters will be described for convenience.

5 Information on the 0th drive is recorded in the 0th physical cluster 10-0 and information on the 0th state of the disc is recorded in the first physical cluster 10-1. Next, when another drive, i.e., a first drive, records data on and/ or reproduces data from the disc, information on the first drive and information on a first state of the disc is recorded in the second physical cluster 10-2 and the third physical cluster 10-3, respectively. Here, it is preferable that information on a new drive and information on a new state of the disc is recorded in 0th recording units of corresponding physical clusters, respectively, and then information on previous drives and information on previous states of the disc is copied starting from first recording units. The reason why the information on the previous drives and the information on the previous states of the disc is copied is 15 as previously explained.

When information on a drive and information on the state of a disc is recorded in different physical clusters as described above, it is preferable that at least one of an address of a zone in which information on a last drive is recorded and an address of a zone in which information on a last state of the disc is recorded is recorded as the 20 information on the state of the disc.

An information storage medium (a disc) and a method of recording data thereon according to a third embodiment will be described with reference to FIG. 4A. The present embodiment is characterized in that information on a drive and information on the state of a disc is recorded in one of recording units constituting physical clusters or 25 ECC blocks of the drive & disc zone 10d. In detail, information on a used drive, i.e., a 0th drive, and information on a 0th state of the disc is recorded in a 0th recording unit 10-0-0 of a 0th physical cluster 10-0. Thereafter, when another drive, i.e., a first drive, records data on and/or reproduces data from the disc, information on the first drive and information on a first state of the disc is recorded in a 0th recording unit 10-1-0 of a first 30 physical cluster 10-1 right after the 0th physical cluster 10-0. The information on the 0th drive and the information on the 0th state of the disc is copied into a first recording unit 10-1-1 of the first physical cluster 10-1.

When a second drive records data on and/or reproduces data from the disc, information on the second drive and information on a second state of the disc is recorded in a 0th recording unit 10-2-0 of a second physical cluster 10-2. The information on the first drive and the first state of the disc and the 0th drive, and the 5 information on the 0th drive and the 0th state of the disc is copied into first and second recording units 10-2-1 and 10-2-2, respectively.

As shown in FIG. 4B, in order to increase the reliability of recording/reproducing of information on a drive and information on the state of a disc, original information on the drive and original information on the state of the disc may be recorded in a 10 predetermined physical cluster, and then copied into another physical cluster. For example, original information on a 0th drive and original information on a 0th state of the disc is recorded in a 0th recording unit 10-0-0 of a 0th physical cluster 10-0, and then copied into a 0th recording unit 10-1-0 of a first physical cluster 10-1.

When another drive, i.e., a first drive, records data and/or reproduces data from 15 the disc, original information on the first drive and original information on a first state of the disc is recorded in a second physical cluster 10-2 right after the first physical cluster 10-1 into which the original information on the 0th drive and the original information on the 0th state of the disc is copied, and then copied into a third physical cluster 10-3. In 20 the present embodiment, original information on a drive and original information on the state of a disc is first recorded and then copied. However, this may be applied to the first and second embodiments. Therefore, when original information on a drive and original information on the state of a disc is damaged or a defect appears, copied information on the drive and copied information on the state of the disc can be reproduced. As a result, an efficiency of recording and/or reproducing data can be 25 improved.

Information on a drive and information on the state of a disc recorded in a recording unit according to the third embodiment is as shown in FIG. 5.

An information storage medium (a disc) and a method of recording data thereon according to a fourth embodiment of the present invention will be described with 30 reference to FIGS. 6A and 6B. Referring to FIGS. 6A and 6B, a drive & disc zone 10d of a recordable zone 10 of a lead-in or lead-out area, except a user data area, is divided into two zones. Information on a drive is recorded in the fore zone and information on the state of a disc is recorded in the back zone. The drive & disc zone 10d shown in

FIG. 6A is the same as that shown in FIG. 1 except that the drive & disc zone 10d is divided into two zones, and thus will not be explained herein.

As shown in FIG. 6B, the drive & disc zone 10d is, for example, composed of $n+1$ physical clusters or ECC blocks. Information on the drive is recorded in the fore half of the drive & disc zone 10d and information on the state of the disc is recorded in the back half of the drive & disc zone 10d. In other words, whenever information on a new drive is recorded, the information is sequentially recorded starting from a 0th physical cluster 10-0 to a $(n-1)/2$ th physical cluster 10- $(n-1)/2$. Whenever information on the state of the disc is updated, the updated information is sequentially recorded starting from a $(n+1)/2$ th physical cluster 10- $(n+1)/2$ to an n th physical cluster 10-n.

In more detail, information on a 0th drive is recorded in a 0th recording unit 10-0-0 of a 0th physical cluster 10-0, and then information on a 0th state of the disc is recorded in a 0th recording unit 10- $(n+1)/2$ of a $(n+1)/2$ th physical cluster 10- $(n+1)/2$. Next, when a new drive, i.e., a first drive, records data on and/or reproduces data from the disc, information on the first drive is recorded in a 0th recording unit 10-1-0 of a first physical cluster 10-1. Here, it is preferable that the information on the 0th drive is copied into a first recording unit 10-1-1 of the first physical cluster 10-1. Information on a first state of the disc is recorded in a 0th recording unit 10- $(n+3)/2$ -0 of a $(n+3)/2$ th physical cluster 10- $(n+3)/2$, and then the information on the 0th state of the disc is copied into a first recording unit 10- $(n+3)/2$ -1 of the $(n+3)/2$ th physical cluster 10- $(n+3)/2$.

In the above-described first through fourth embodiments, information on a drive is recorded prior to information on the state of a disc. However, the information on the state of the disc may be recorded prior to the information on the drive.

FIG. 7A is a view for explaining an example of a method of recording data on an information storage medium (a disc) according to a fifth embodiment of the present invention. The drive & disc zone 10d may include $n+1$ physical clusters or ECC blocks ranging from a 0th physical cluster or ECC block 10-0 to a n th physical cluster or ECC block 10-n. The 0th physical cluster or ECC block 10-0 may be composed of $m+1$ recording units ranging from a 0th recording unit 10-0-0 to an m th recording unit.

The method of recording data on the information storage medium according to the fifth embodiment is characterized in that when information on a drive and information on the state of a disc is updated, information on a previous state of the disc is not recorded but only updated information on the state of the disc is only recorded.

However, information on a new drive is recorded and information on a previous drive is copied. Thus, when information on the drive and information on the state of the disc is updated, the updated information may be recorded in another positions.

For example, as shown in FIG. 7A, information on the state of the disc may be recorded in a starting recording unit of a physical cluster or ECC block and information on the drive may be recorded in a recording unit right after the starting recording unit. In detail, information on a 0th state of the disc is recorded in a 0th recording unit 10-0-0 of a 0th physical cluster 10-0 and information on a 0th drive is recorded in a first recording unit 10-0-1 of the 0th physical cluster 10-0. Dummy data is recorded in remaining recording units of the 0th physical cluster 10-0. When a new drive records data on and/or reproduces data from the disc, information on a new state of the disc, i.e., a first state of the disc, is recorded in a 0th recording unit 10-1-0 of a first physical cluster 10-1. Information on the new drive, i.e., a first drive, is recorded in a first recording unit 10-1-1 of the first physical cluster 10-1. The information on the 0th drive is copied into a second recording unit 10-1-2 of the first physical cluster 10-1.

When information on a second state of the disc and information on a second drive is recorded in a second physical cluster 10-2, the information in the second state of the disc is recorded in a 0th recording unit 10-2-0 of the second physical cluster 10-2 and the information on the first and 0th states of the disc is not recorded. The information on the second drive is recorded in a first recording unit 10-2-1 and the information on the first drive and the information on the 0th drive is copied into a second recording unit 10-2-2 and a third recording unit 10-2-3, respectively.

In the fifth embodiment, only updated information on the state of a disc is recorded, but information on previous states of the disc is not recorded. As for information on used drives, information on a new drive is recorded and information on previous drives is copied.

The information on the state of the disc, for example, may be at least one of an address of a zone in which new OPC data is recorded, an address of a zone in which information on a last drive or information on a last state of a disc is recorded, a last recorded address of a zone of a user data area in which user data is lastly recorded, write protection information, information on the number of sessions, information necessary for determining whether additional user data is recordable, an address of a zone in which information on a subsequent drive or information on a subsequent state

of the disc is to be recorded, and an address of a zone in which subsequent user data is to be recorded. If one of these addresses is changed into a new one, information on the previous address is unnecessary. Thus, it is preferable that only updated information on the state of the disc is recorded.

5 In an event that information on a new drive contains pieces of information similar or equal to pieces of information on a previous drive, the new drive can be easily set up using the pieces of information on the previous drive. Therefore, since the information on the previous drive may be used, it is preferable that information on a new drive is recorded along with information on a previous drive.

10 As shown in FIG. 7B, in order to increase the reliability of information on the state of a disc and information on a drive, the information on the state of the disc and the information on the drive can be copied from a physical cluster to another. For example, information on a 0th state of the disc and information on a 0th drive is recorded in a 0th physical cluster 10-0, and then copied into a first physical cluster 10-1. Information on a first state of the disc is recorded in a 0th recording unit 10-2-0 of a second physical cluster 10-2, information on a first drive is recorded in a first recording unit 10-2-1 of the second physical cluster 10-2, and the information on the 0th drive is copied into a second recording unit 10-2-2 of the second physical cluster 10-2, and then copied into a third physical cluster 10-3.

20 Another example of the fifth embodiment will be described with reference to FIG. 8A.

25 Information on a new drive is recorded in a starting recording unit of a predetermined physical cluster and information on a previous drive is copied into a recording unit right after the starting recording unit. Next, information on a new state of a disc is recorded in a last recording unit of the predetermined physical section.

30 In detail, information on a 0th drive is recorded in a 0th recording unit 10-0-0 of a 0th physical cluster 10-0 and information on a 0th state of the disc is recorded in an mth recording unit 10-0-m of the 0th physical cluster. Information on a first drive is recorded in a 0th recording unit 10-1-0 of a first physical cluster 10-1 and the information on the 0th drive is copied into a first recording unit 10-1-1 of the first physical cluster 10-1. Information on a first state of the disc is recorded in an mth recording unit 10-1-m of the first physical cluster 10-1. Every time information on the drive and information on the state of the disc is updated, recording is performed according to this method.

This method has an advantage in that a position in which information on the state of the disc is updated is determined as a last recording section.

As shown in FIG. 8B, in order to increase the reliability of information on the state of a disc and information on a drive, the information on the state of the disc and the 5 information on the drive can be copied from a physical cluster to another.

Another example of the fifth embodiment will be explained with reference to FIG. 9. In this example, information on a drive is first recorded, and then updated information on the state of a disc is recorded in a recording unit right after a recording unit in which information on the drive is lastly recorded.

10 For example, information on a 0th drive is recorded in a 0th recording unit 10-0-0 of a 0th physical cluster 10-0 and information on a 0th state of the disc is recorded in a first recording unit 10-0-1 of the 0th physical cluster 10-0. Information on a first drive is recorded in a 0th recording unit 10-1-0 of a first physical cluster 10-1 and the information on the 0th drive is copied into a first recording unit 10-1-1 of the first physical cluster 15 10-1. Next, information on a first state of the disc is recorded in a second recording unit 10-1-2 of the first physical cluster 10-1.

20 In other words, in this example, information on a new drive is recorded in a starting recording unit of a predetermined physical cluster, information on a previous drive is copied into a recording unit right after the starting recording unit, and information on a new state of a disc is recorded in a recording unit right after the recording unit into which the information on the previous drive is copied.

According to the example described with reference to FIG. 9, when information 25 on a new drive and information on a new state of a disc is recorded, information on a previous drive and information on a previous state of the disc can be copied into a physical cluster following a physical cluster in which the information on the previous drive and the information on the previous state of the disc is recorded, in order to increase the reliability of information.

The recording units may be sectors or data frames, and in particular, updated 30 information on the state of the disc may be regarded as being recorded in one recording unit.

In summary, in a method of recording information on an information storage medium (a disc) according to the present invention, information on drives and information on states of a disc is recorded in a drive & disc zone 10d of a recordable

zone of a lead-in or lead-out area except a user data area. The drive & disc zone 10d is composed of a plurality of physical clusters or ECC blocks. Also, whenever information on a new drive and information on a new state of the disc is recorded, the information on the new drive and the information on the new state of the disc is

5 recorded in a physical cluster or ECC block different from a physical cluster or ECC block in which information on a previous drive and information on a previous state of the disc is recorded.

Information on a used drive and information on the state of a disc may be recorded in a physical cluster or ECC block or different physical clusters or ECC blocks.

10 In addition, each of the plurality of physical clusters or ECC blocks is composed of a plurality of recording units such as sectors or data frames. In a case where information on a used drive and information on the state of a disc is recorded in a physical cluster, the information on the used drive and the information on the state of the disc may be recorded in different recording units of the physical cluster as described with reference to FIG. 2 or in a recording unit of the physical cluster as described with reference to FIG. 15 4A.

In an event that information on used drives and information on the states of a disc is recorded in different physical clusters or ECC blocks, as described with reference to FIG. 3, the information on the used drives and the information on the states

20 of the disc can be alternately recorded starting from a beginning physical cluster or ECC block of the drive & disc zone 10d. Alternatively, as described with reference to FIG. 6B, after the drive & disc zone 10d may be divided into two zones, at least one of information on the used drives and information on the states of the disc may be sequentially recorded in physical clusters or ECC blocks of the fore zone and remaining 25 information may be sequentially recorded in physical clusters or ECC blocks of the remaining zone. In other words, at least one of information on a new drive and information on a new state of the disc is recorded in the fore one of the two divided zones, and remaining information is recorded in the remaining zone. As described above, information on used drives and information on states of a disc can be recorded 30 using various methods.

When information on a new drive is recorded and information on the state of a disc is updated, only the updated information may be recorded and information on a

previous state of the disc may not be recorded. The information on the new drive is recorded together with information on a previous drive.

As shown in FIG. 7A, updated information on the state of a disc may be recorded in a 0th recording unit of a new physical cluster and information on a new drive may be recorded in a first recording unit of the new physical cluster. Also, information on previous drives may be sequentially copied starting from a second recording unit. As a result, a drive & disc zone can be efficiently used by recording only updated information on the state of the disc.

As shown in FIG. 8A, updated information on a drive may be recorded in a 0th recording unit of a predetermined physical cluster, and then information on a previous drive may be copied. Updated information on the state of a disc may be recorded in a last recording unit of the predetermined physical cluster. As shown in FIG. 9, information on a new drive and information on a previous drive may be recorded, and then updated information on a disc may be recorded in a recording unit right after a recording unit in which information on a drive is lastly recorded.

[Effect of the Invention]

As described above, in an information storage medium (a disc) and a method of recording information thereon according to the present invention, zones in which information on drives and information on states of a disc can be efficiently used. Also, the information on the drives and the information on the states of the disc can be used in a new format.

In addition, the information storage medium and the method of recording information thereon according to the present invention can be applied to once-writable information storage media as well as several-time-rewritable information storage media. In particular, when information on a drive and information on the state of a disc is recorded on a once-writable information storage medium, the information on the drive and the information on the state of the disc can be recorded only one time in a physical cluster or ECC block. Thus, when information on a new drive and information on a new state of the disc is recorded, the physical cluster or ECC block in which the information on the drive and the information on the state of the disc cannot be used. Instead, the information on the new drive and the information on the new state of the disc should be recorded in a physical cluster or ECC block right after a physical cluster

or ECC block in which information on a last drive and information on a last state of the disc is recorded. Therefore, it is preferable that the method of recording information according to the present invention is applied to once-writable information storage medium.

5 Moreover, in a case of a several-time-rewritable information storage medium, information on previous drives and information on previous states of the disc is recorded in a zone in which information on a last drive and information on a last state of the disc is recorded. Thus, a drive & disc zone can be efficiently managed by reproducing only the zone in which the information on the last drive and the information on the last state 10 of the disc is recorded.

10 Furthermore, whenever recording of user data is completed, information on a latest state of a disc is recorded. Thus, a pickup can rapidly access an exact position in which user data is to be recorded next time. As a result, since user data can be recorded using the information on the latest state of the disc, recording/reproduction 15 efficiency can be improved.

15 While the present invention has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the spirit and scope of the present invention as defined by the following 20 claims.

What is claimed is:

1. An information storage medium (a disc) comprising an area and a user data area, the area including a recordable zone having a drive & disc zone in which information on a drive and information on a state of the disc is recorded, wherein the drive & disc zone includes a plurality of physical clusters or ECC blocks and the information on the drive and the information on the state of the disc is recorded in a physical cluster or ECC block.
5
2. The information storage medium of claim 1, wherein whenever the information on the drive and the information on the state of the disc is updated, the updated information is recorded in a physical cluster or ECC block different from a physical cluster or ECC block in which information on a previous drive and information on a previous state of the disc is recorded.
10
3. The information storage medium of claim 2, wherein whenever the information on the drive and the information on the state of the disc is updated, the updated information is recorded in a physical cluster or ECC block right after a physical cluster or ECC block in which information on a previous drive and information on a previous state of the disc is recorded.
15
4. The information storage medium of claim 2, wherein each of the plurality of physical clusters or ECC blocks comprises a plurality of recording units, and the information on the drive and the information on the state of the disc is sequentially recorded in different recording units of a physical cluster or an ECC block.
20
5. The information storage medium of claim 2, wherein each of the plurality of physical clusters or ECC blocks comprises a plurality of recording units, and the information on the drive and the information on the state of the disc is recorded in the same recording unit of a physical cluster.
25
6. The information storage medium of claim 4 or 5, wherein the plurality of recording units are sectors or data frames.
30

7. The information storage medium of claim 4 or 5, wherein the information on the drive and the information on the state of the disc is copied into a physical cluster or ECC block following a physical cluster or ECC block in which the information on the drive and the information on the state of the disc is recorded.

5

8. The information storage medium of claim 4 or 5, wherein information on a new drive and information on a latest state of the disc is recorded in a starting recording unit of the physical cluster or ECC block, and then the information on the drive and the information on the state of the disc is copied into a recording unit right after the starting recording unit.

10

9. The information storage medium of any one of claims 1 through 5, wherein the information on the state of the disc comprises at least one of an address of a zone in which new OPC data is recorded, an address of a zone in which information on a last drive and information on a latest state of the disc is recorded, a last recorded address of a zone in which user data is lastly recorded, information on the number of sessions, write protection information, and information for indicating whether additional user data is recordable after recording user data.

20

10. The information storage medium of any one of claims 1 through 5, wherein the information on the state of the disc comprises information necessary for indicating an address of a zone in which information on a subsequent drive and information on a subsequent state of the disc is to be recorded or information necessary for indicating an address of a zone in which user data is to be recorded.

25

11. The information storage medium of any one of claims 1 through 5, wherein the area is at least one of a lead-in area and a lead-out area.

30

12. An information storage medium (a disc) comprising an area and a user data area, the area including a recordable zone having a drive & disc zone in which information on a drive and information on a state of the disc is recorded, wherein the drive & disc zone includes a plurality of physical clusters or ECC blocks and the

information on the drive and the information on the state of the disc is recorded in different physical clusters or ECC blocks.

13. The information storage medium of claim 12, wherein whenever the
5 information on the drive and the information on the state of the disc is updated, the updated information is recorded in a physical cluster or ECC block different from a physical cluster or ECC block in which information on a previous drive and information on a previous state of the disc is recorded.

10 14. The information storage medium of claim 13, wherein whenever the information on the drive and the information on the state of the disc is updated, the updated information is recorded in a physical cluster or ECC block right after a physical cluster or ECC block in which information on a previous drive and information on a previous state of the disc is recorded.

15 15. The information storage medium of claim 13, wherein the information on the drive and the information on the state of the disc are sequentially and alternately recorded starting from a beginning part of the drive & disc zone.

20 16. The information storage medium of claim 13, wherein the drive & disc zone is divided into two zones, and one of the information on the drive and the information on the state of the disc is recorded in a first zone of two zones and the remaining information is recorded in a second zone of two zones.

25 17. The information storage medium of any one of claims 12 through 16, wherein the information on the drive and the information on the state of the disc is copied into a physical cluster or ECC block following a physical cluster or ECC block in which the information on the drive and the information on the state of the disc is recorded.

30 18. The information storage medium of any one of claims 12 through 16, wherein information on a new drive and information on a latest state of the disc is recorded in a starting recording unit of the physical cluster or ECC block, and then the

information on the drive and the information on the state of the disc is copied into a recording unit right after the starting recording unit.

19. The information storage medium of any one of claims 12 through 16,
5 wherein the information on the state of the disc comprises at least one of an address of a zone in which new OPC data is recorded, an address of a zone in which information on a last drive and information on a latest state of the disc is recorded, a last recorded address of a zone in which user data is lastly recorded, information on the number of sessions, write protection information, and information for indicating whether additional
10 user data is recordable after recording user data.

20. The information storage medium of any one of claims 12 through 16,
wherein the information on the state of the disc comprises information necessary for
15 indicating an address of a zone in which information on a subsequent drive and
information on a subsequent state of the disc is to be recorded or information necessary
for indicating an address of a zone in which user data is to be recorded.

21. The information storage medium of any one of claims 12 through 16,
wherein the area is at least one of a lead-in area and a lead-out area.
20

22. A method of recording information on an information storage medium (a disc), the method comprising:

recording information on a drive and information on a state of the disc in one of a plurality of physical clusters or ECC blocks of a drive & disc zone of a recordable zone
25 included in an area except a user data area; and

recording information on a new drive and information on a latest state of the disc in a physical cluster or an ECC block different from a physical cluster or an ECC block in which the information on the drive and the information on the state of the disc is recorded whenever the information on the drive and the information on the state of the disc is updated.
30

23. The method of claim 22, wherein whenever the information on the drive and the information on the state of the disc is updated, the updated information is

recorded in a physical cluster or ECC block right after a physical cluster or ECC block in which information on a previous drive and information on a previous state of the disc is recorded.

5 24. The method of claim 23, wherein each of the plurality of physical clusters or ECC blocks comprises a plurality of recording units, and the information on the drive and the information on the state of the disc is sequentially recorded in different recording units of a physical cluster or an ECC block.

10 25. The method of claim 23, wherein each of the plurality of physical clusters or ECC blocks comprises a plurality of recording units, and the information on the drive and the information on the state of the disc is recorded in the same recording unit of a physical cluster.

15 26. The method of claim 24 or 25, wherein the plurality of recording units are sectors or data frames.

20 27. The method of claim 24 or 25, wherein the information on the drive and the information on the state of the disc is copied into a physical cluster or ECC block following a physical cluster or ECC block in which the information on the drive and the information on the state of the disc is recorded.

25 28. The method of claim 24 or 25, wherein information on a new drive and information on a latest state of the disc is recorded in a starting recording unit of the physical cluster or ECC block, and then the information on the drive and the information on the state of the disc is copied into a recording unit right after the starting recording unit.

30 29. The method of any one of claims 22 through 25, wherein the information on the state of the disc comprises at least one of an address of a zone in which new OPC data is recorded, an address of a zone in which information on a last drive and information on a latest state of the disc is recorded, a last recorded address of a zone in which user data is lastly recorded, information on the number of sessions, write

protection information, and information for indicating whether additional user data is recordable after recording user data.

30. The method of any one of claims 22 through 25, wherein the information
5 on the state of the disc comprises information necessary for indicating an address of a zone in which information on a subsequent drive and information on a subsequent state of the disc is to be recorded or information necessary for indicating an address of a zone in which user data is to be recorded.

10 31. The method of any one of claims 22 through 25, wherein the area is at least one of a lead-in area and a lead-out area.

32. A method of recording information on an information storage medium (a disc), the method comprising:

15 recording information on a drive and information on a state of the disc in different physical clusters or ECC blocks of a plurality of physical clusters or ECC blocks of a drive & disc zone of a recordable zone included in an area except a user data area; and
recording information on a new drive and information on a latest state of the disc in a physical cluster or ECC block different from a physical cluster or ECC block in
20 which the information on the drive and the information on the state of the disc is recorded whenever the information on the drive and the information on the state of the disc is updated.

25 33. The method of claim 32, wherein whenever the information on the drive and the information on the state of the disc is updated, the updated information is recorded in a physical cluster or ECC block right after a physical cluster or ECC block in which information on a previous drive and information on a previous state of the disc is recorded.

30 34. The method of claim 33, wherein the information on the drive and the information on the state of the disc are sequentially and alternately recorded starting from a beginning part of the drive & disc zone.

35. The method of claim 33, wherein the drive & disc zone is divided into two zones, and one of the information on the drive and the information on the state of the disc is recorded in a first zone of two zones and the remaining information is recorded in a second zone of two zones.

5

36. The method of any one of claims 32 through 35, wherein the information on the drive and the information on the state of the disc is copied into a physical cluster or ECC block following a physical cluster or ECC block in which the information on the drive and the information on the state of the disc is recorded.

10

37. The method of any one of claims 32 through 35, wherein information on a new drive and information on a latest state of the disc is recorded in a starting recording unit of the physical cluster or ECC block, and then the information on the drive and the information on the state of the disc is copied into a recording unit right after the starting recording unit.

15

38. The method of any one of claims 32 through 35, wherein the information on the state of the disc comprises at least one of an address of a zone in which new OPC data is recorded, an address of a zone in which information on a last drive and information on a latest state of the disc is recorded, a last recorded address of a zone in which user data is lastly recorded, information on the number of sessions, write protection information, and information for indicating whether additional user data is recordable after recording user data.

20

39. The method of any one of claims 32 through 35, wherein the information on the state of the disc comprises information necessary for indicating an address of a zone in which information on a subsequent drive and information on a subsequent state of the disc is to be recorded or information necessary for indicating an address of a zone in which user data is to be recorded.

25

40. An information storage medium (a disc) comprising an area and a user data area, the area including a recordable zone having a drive & disc zone in which information on a drive and information on the state of the disc is recorded, wherein the

drive & disc zone includes a plurality of physical clusters or ECC blocks, and information on a new drive and updated information on the state of the disc is recorded in a physical cluster or an ECC block following a physical cluster or an ECC block in which the information on the drive and the information on the state of the disc is recorded and the 5 information on the drive is copied into the physical cluster or ECC block containing the information on the new drive and the updated information on the state of the disc.

41. The information storage medium of claim 40, wherein the updated information on the state of the disc is recorded in a 0th recording unit of a predetermined 10 physical cluster or ECC block, the updated information on the drive is recorded in a first recording unit right after the 0th recording unit, and the information on the previous drives is sequentially copied into recording units after the first recording unit.

42. The information storage medium of claim 40, wherein the updated 15 information on the drive is recorded in a 0th recording unit of a predetermined physical cluster or an ECC block, the information on previous drives is sequentially copied into recording units after the 0th recording unit, and the updated information on the state of the disc is recorded in a recording unit right after a last one of the recording units into which the information on the previous drives is copied.

20 43. The information storage medium of claim 40, wherein the updated information on the drive is recorded in a 0th recording unit of a predetermined physical cluster or an ECC block, the information on previous drives is sequentially copied into recording units after the 0th recording unit, and the updated information on the state of 25 the disc is recorded in a recording unit right after a last one of the recording units into which the information on the previous drives is copied.

44. The information storage medium of any one of claims 40 through 43, wherein the updated information on the state of the disc is recorded in one of recording 30 units constituting each of the plurality of physical clusters or ECC blocks.

45. The information storage medium of any one of claims 40 through 43, wherein the information on the drive and the information on the state of the disc is

copied into a physical cluster or an ECC block following a physical cluster or an ECC block in which the information on the drive and the information on the state of the disc is recorded.

5 46. The information storage medium of any one of claims 40 through 43, wherein the drive & disc zone is included in at least one of a lead-in area and a lead-out area.

10 47. A method of recording information on an information storage medium (a disc), the method comprising:

recording information on a state of the disc and information on a drive in one of a plurality of physical clusters or ECC blocks of a drive & disc zone of a recordable zone included an area except a user data area;

15 recording updated information on the state of the disc and updated information on the drive in a physical cluster or an ECC block following the physical cluster or the ECC block in which the information on the state of the disc and the information on the drive is recorded; and

20 coping the information on the drive after recording the updated information on the drive.

25 48. The method of claim 47, wherein the updated information on the state of the disc is recorded in a 0th recording unit of a predetermined physical cluster or ECC block, the updated information on the drive is recorded in a first recording unit right after the 0th recording unit, and the information on the previous drives is sequentially copied into recording units after the first recording unit.

30 49. The method of claim 47, wherein the updated information on the drive is recorded in a 0th recording unit of a predetermined physical cluster or an ECC block, the information on previous drives is sequentially copied into recording units after the 0th recording unit, and the updated information on the state of the disc is recorded in a recording unit right after a last one of the recording units into which the information on the previous drives is copied.

50. The method of claim 47, wherein the updated information on the drive is recorded in a 0th recording unit of a predetermined physical cluster or an ECC block, the information on previous drives is sequentially copied into recording units after the 0th recording unit, and the updated information on the state of the disc is recorded in a 5 recording unit right after a last one of the recording units into which the information on the previous drives is copied.

51. The method of any one of claims 47 through 50, wherein the updated information on the state of the disc is recorded in one of recording units constituting 10 each of the plurality of physical clusters or ECC blocks.

52. The method of any one of claims 47 through 50, wherein the information on the drive and the information on the state of the disc is copied into a physical cluster or an ECC block following a physical cluster or an ECC block in which the information 15 on the drive and the information on the state of the disc is recorded.

53. The method of any one of claims 47 through 50, wherein the drive & disc zone is included in at least one of a lead-in area and a lead-out area.

FIG. 1

LEAD-IN AREA	DESCRIPTION	USE PURPOSE
READ-ONLY ZONE (5)	PITS OR HIGH FREQUENCY WOBBLLES	DISC-RELATED CONTROL DATA
RECORDABLE ZONE (10)	DMA (10a)	DEFECT MANAGEMENT
	CONTROL DATA ZONE (10b)	DATA INFORMATION (CONTROL DATA)
	OPC TEST ZONE (10c)	OPC TESTING (OPC DATA)
	DRIVE & DISC ZONE (10d)	INFORMATION ON DRIVE AND INFORMATION ON THE STATE OF DISC
	BUFFER ZONE (10e)	BUFFER FOR USER DATA AREA

FIG. 2

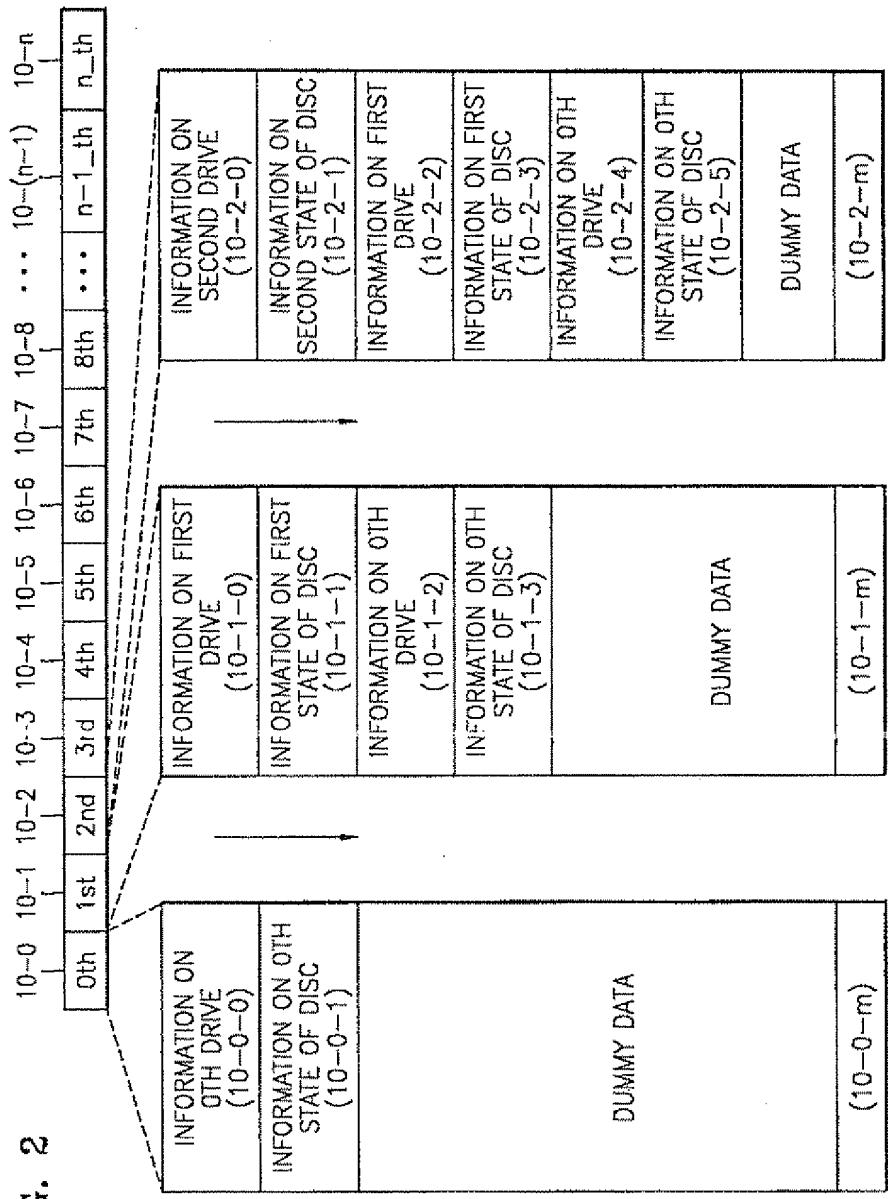


FIG. 3

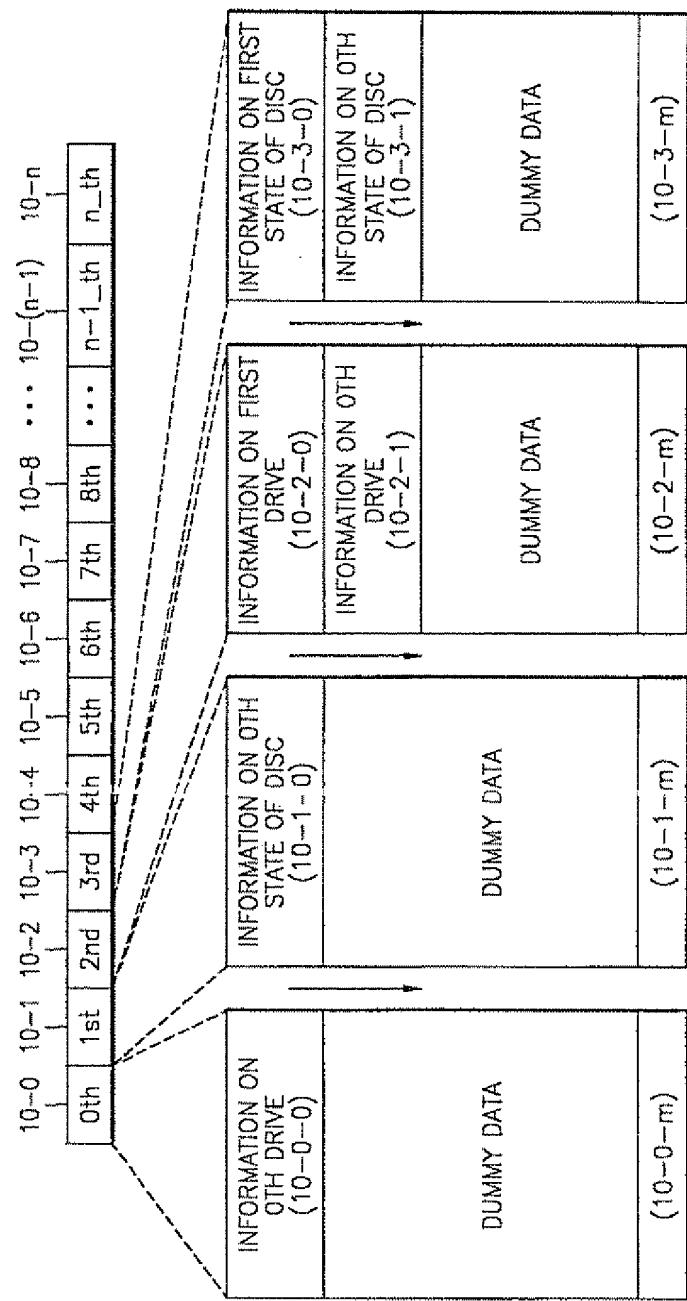


FIG. 4A

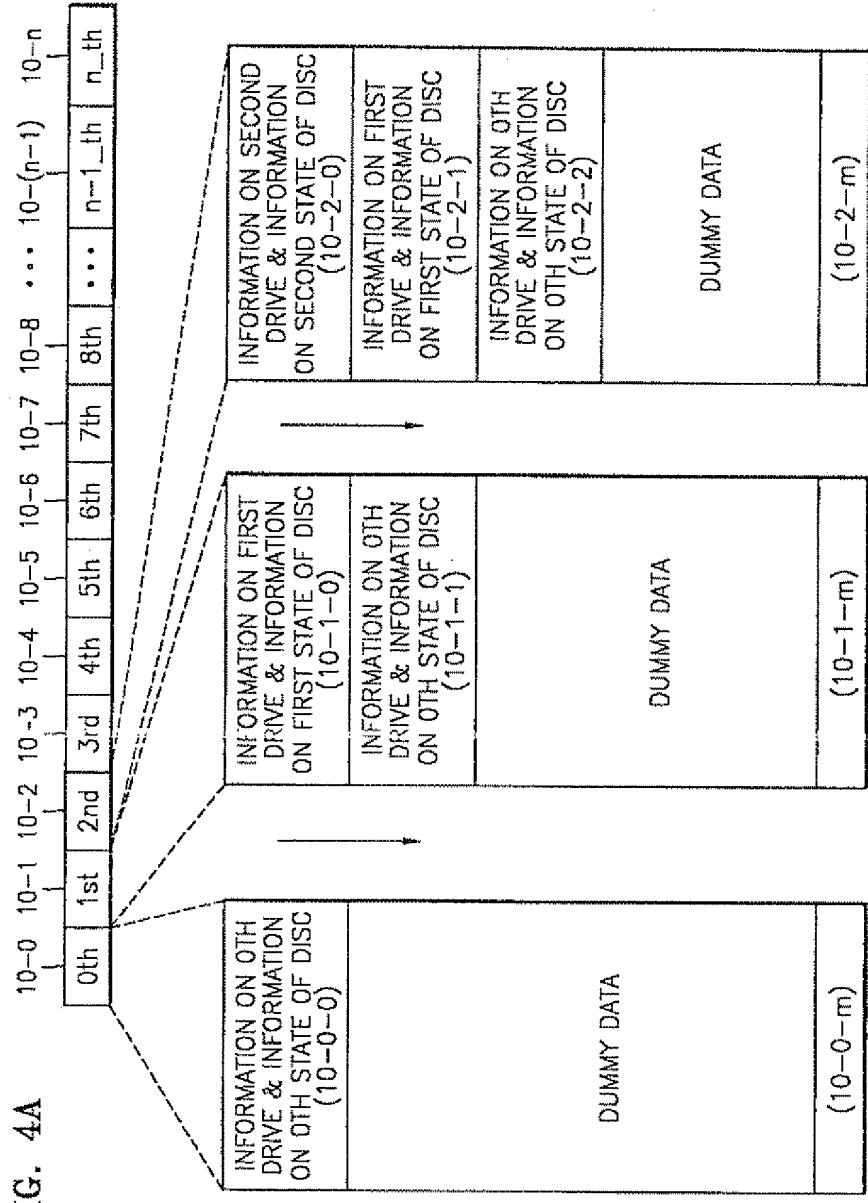


FIG. 4B

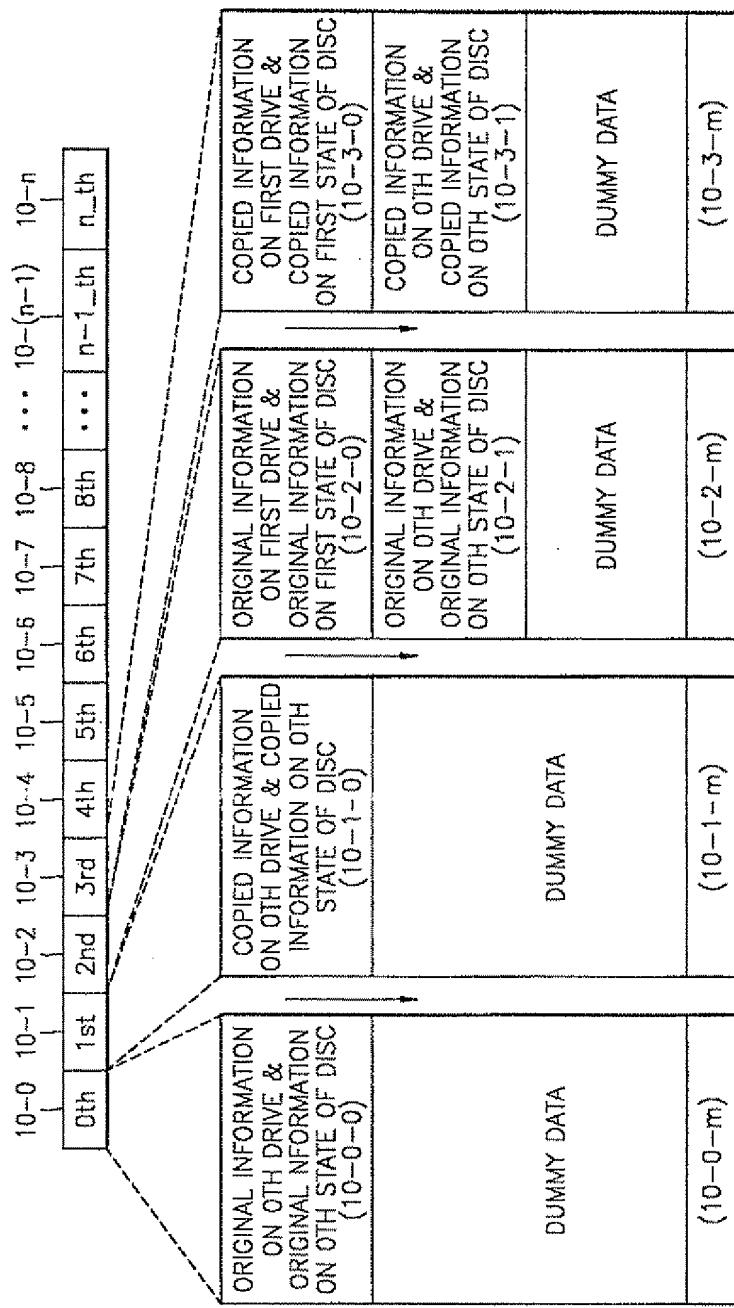


FIG. 5

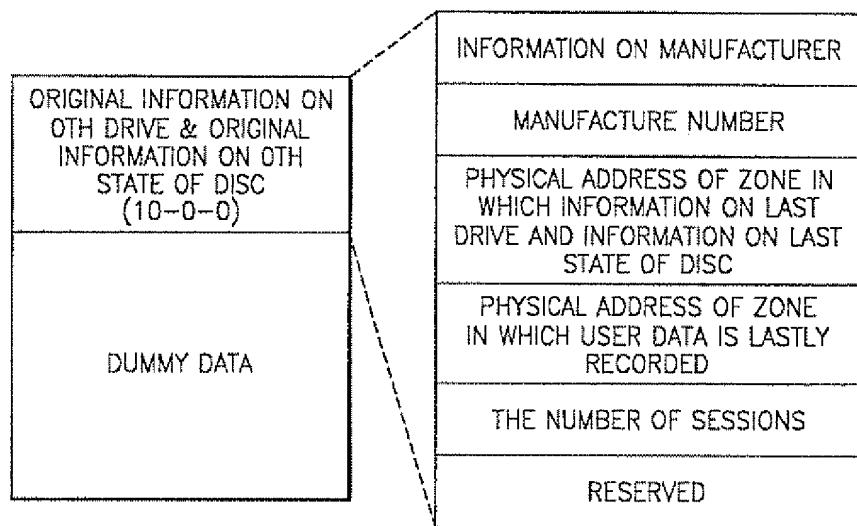


FIG. 6A

LEAD-IN AREA	DESCRIPTION	USE PURPOSE
READ-ONLY ZONE (5)	PITS OR HIGH FREQUENCY WOBBLIES	DISC-RELATED CONTROL DATA
RECORDABLE ZONE (10)	DMA (10a)	DEFECT MANAGEMENT
	CONTROL DATA ZONE (10b)	DATA INFORMATION (CONTROL DATA)
	OPC TEST ZONE (10c)	OPC TESTING (OPC DATA)
	DRIVE & DISC ZONE (10d)	DRIVE-RELATED INFORMATION
		DISC STATE-RELATED INFORMATION
	BUFFER ZONE (10e)	BUFFER FOR USER DATA ZONE

FIG. 6B

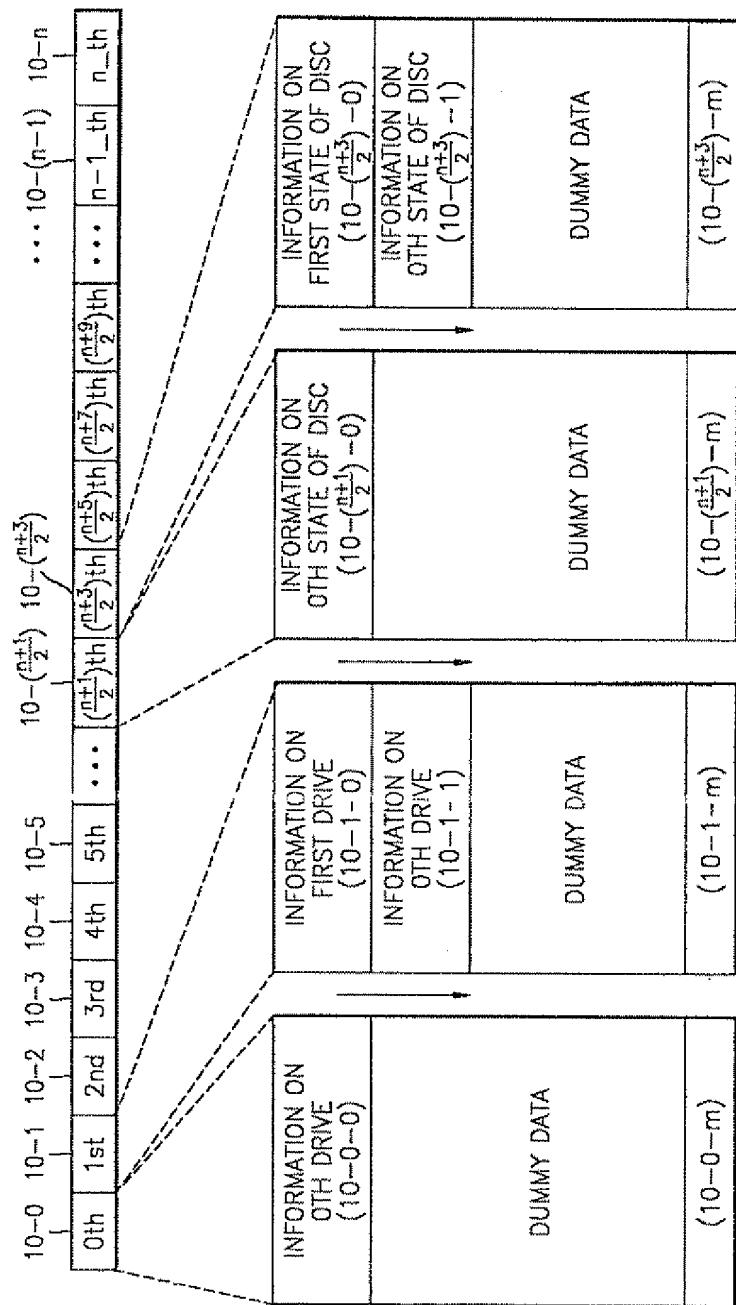


FIG. 7A

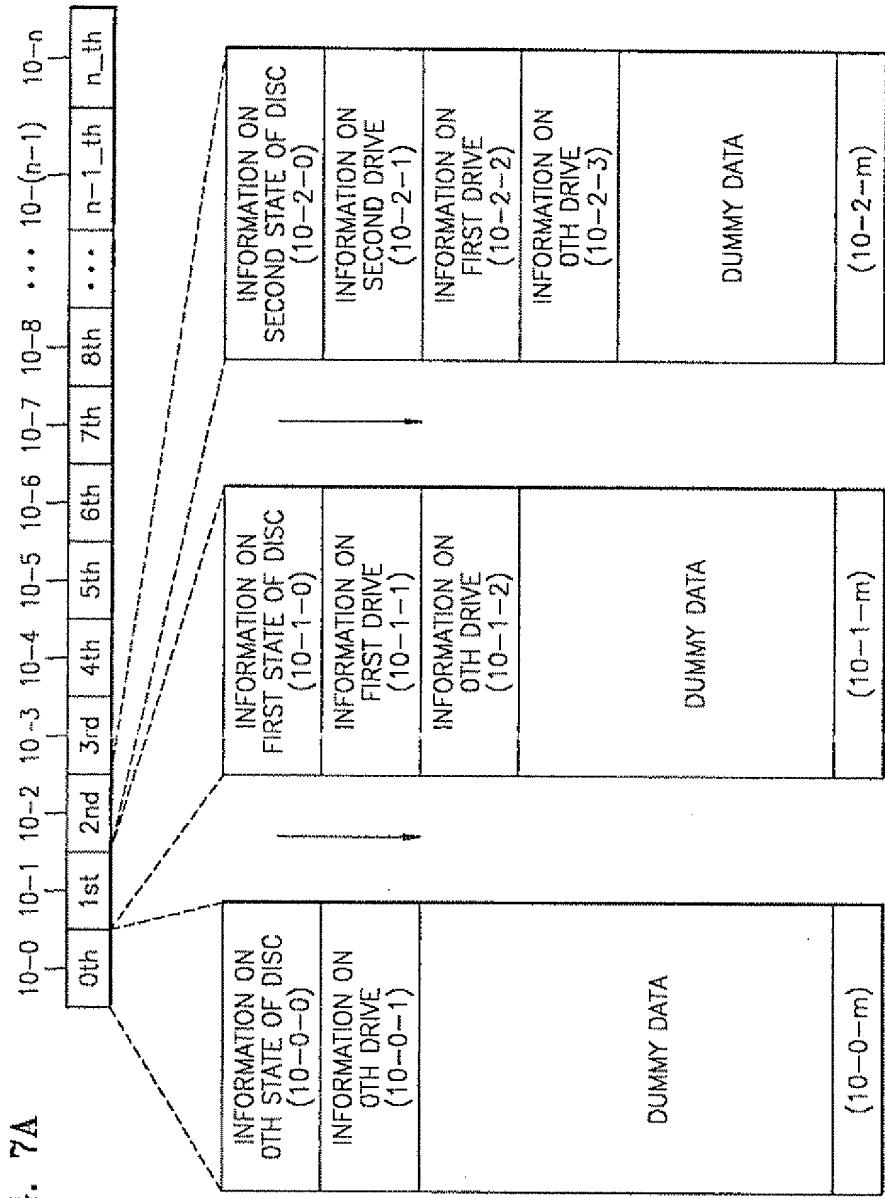


FIG. 7B

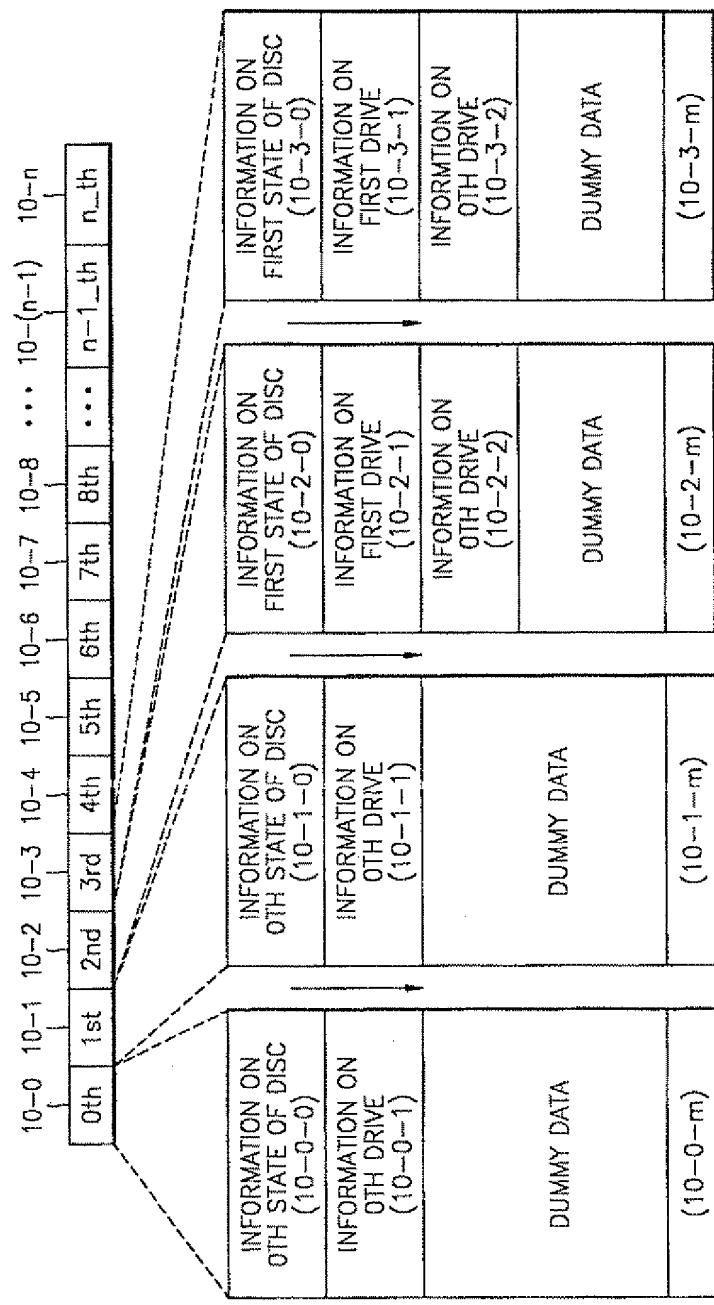


FIG. 8A

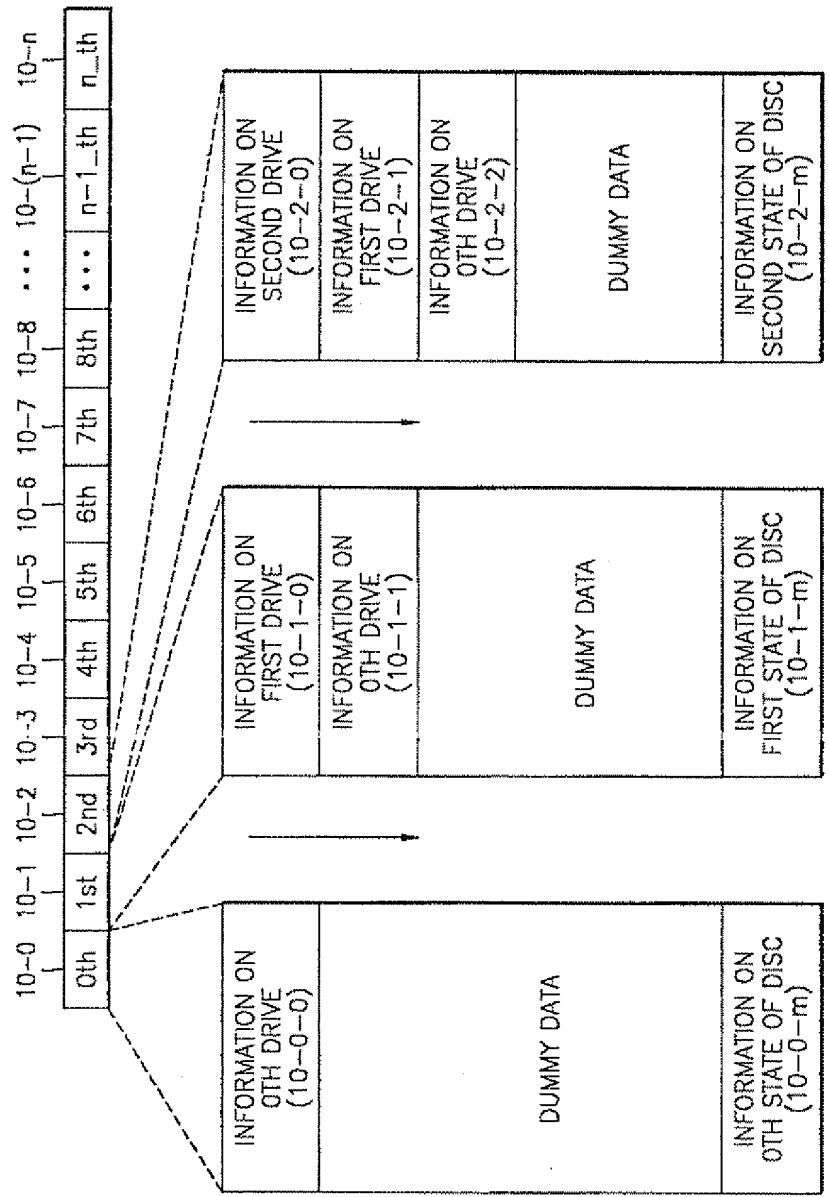


FIG. 8B

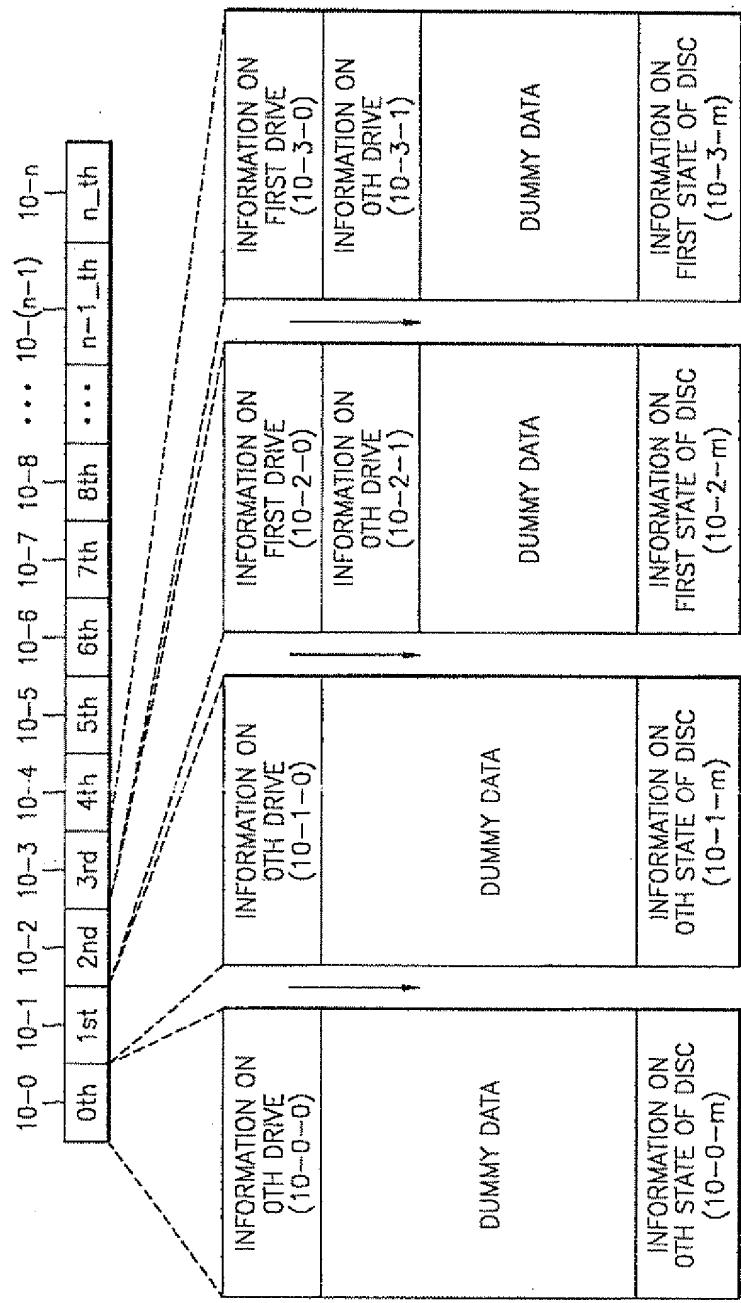


FIG. 9

